cess, no competent mechanist can be at a loss to adapt means to the end proposed. The means which we have found best for this purpose are either bellows or a pump. If bellows be employed, a tube or nose made of leather, or any similar contrivance, will be found a convenient appendage, fastened to the nozzle of the bellows, for conveying the air into the water cask, and it will be found convenient to attach to the end intended to discharge the air a piece of tube, made of iron or copper, and perforated with small holes, to divide the air into numerous small streams, that the surface of water brought into contact with the air may be the greater.

If a pump be employed, which we prefer, it should be furnished with a similar nose or pipe, and the valves must be so disposed that the pump on being worked may at each stroke take in a charge of air, and force it to pass through the water intended to be purified. In either case the tube that discharges the air into the water should pass into it deep enough to reach the bottom of the cask, and the effect will be, that the offensive gas held in solution in the water (and which on board ship is generally hydrogen derived from the decomposition of a portion of the water, and holding different substances in solution derived from the decomposition of the wood,) will, by continuing the process, be in a short time expelled from the water; after which the water should be left at rest for a little time, to allow its insoluble impurities to subside.

We need hardly add, that the pump intended for this process may, by a judicious arrangement and adaptation of parts, be rendered applicable to other very useful purposes on board a ship, as for watering a ship from a-long side, and conveying the water when required from the hold to the deck, and by means of an air vessel and discharging pipe, judiciously attached to the pump, it may be employed as an engine for wetting the sails or extinguishing fire. And, in addition to all these uses, the same pump may be easily adapted to the purpose of ventillation, by drawing foul air from the hold and replacing it with fresh air. These things are mentioned merely because it is particularly desirable on board ships that every implement should be made as universal in its application as may be consistent with its primary purpose.

In witness whereof, &c.

On the Motions of the Tendrils of Plants; by Thomas Andrew Knight, esq. F.R.S.

[From the Philosophical Transactions of the Royal Society of London.]

The motions of the tendrils of plants, and the efforts they apparently make to approach and attach themselves to contiguous objects, have been supposed by many naturalists to originate in some degrees of sensation and perception: and though other naturalists have rejected this hypothesis, few or no experiments have been made by them to ascertain with what propriety the various motions of tendrils, of different kinds, can be attributed to peculiarity of organization, and the operation of external causes. I was consequently induced, during the last summer, to employ a considerable portion of time to watch the motions of the tendrils of different species of plants; and I now give an account of the observations I was enabled to make.

The plants selected were the Virginian creeper, (the ampelopsis quinquefolia of Michaux,) the ivy, and the common vine and pea.

A plant of the ampelopsis, which grew in a garden-pot, was removed to a forcing-house in the end of May, and a single shoot from it was made to grow perpendicularly upwards, by being supported in that position by a very slender bar of wood, to which it was bound. The plant was placed in the middle of the house, and was fully exposed to the sun; and every object around it was removed far beyond the reach of its tendrils. Thus circumstanced, its tendrils, as soon as they were nearly full grown, all pointed towards the north, or back wall, which was distant about eight feet: but not meeting with any thing in that direction to which they could attach themselves, they declined gradually towards the ground, and ultimately attached themselves to the stem beneath, and the slender bar of wood.

A plant of the same species was placed at the east end of the house, near the glass, and was in some measure screened from the perpendicular light; when its tendrils pointed towards the west, or centre of the house, as those under the preceding circumstances had pointed towards the north and back wall. This plant was removed to the west end of the house, and exposed to the evening sun, being screened as in the preceding case, from the perpendicular light; and its tendrils within a few

hours changed their direction, and again pointed to the centre of the house, which was partially covered with vines. This plant was then removed to the centre of the house, and fully exposed to the perpendicular light, and to the sun; and a piece of dark coloured paper was placed upon one side of it just within the reach of its tendrils; and to this substance they soon appeared to be strongly attracted. The paper was then placed upon the opposite side, under similar circumstances, and there it was soon followed by the tendrils. It was then removed, and a piece of plate glass was substituted; but to this substance the tendrils did not indicate any disposition to approach. The position of the glass was then changed, and care was taken to adjust its surface to the varying position of the sun, so that the light reflected might continue to strike the tendrils; which then receded from the glass, and appeared to be strongly repulsed by it.

The tendrils of the ampelopsis very closely resemble those of the vine in their internal organization, and in originating from the alburnous substance of the plant; and in being under certain circumstances, convertible into fruit stalks. The claws, or claspers, of the ivy, to experiments upon which I shall now proceed, appear to be cortical protrusions only; but to be capable (I have reason to believe) of becoming perfect roots, under favourable circumstances. Experiments, in every respect very nearly similar to the preceding, were made upon this plant; but I found it necessary to place the different substances, to which I proposed that the claws should attempt to attach themselves, almost in contact with the stems of the plants. I observed that the claws of this plant evaded the light just as the tendrils of the ampelopsis had done; and that they sprang only from such parts of the stems as were fully or partially shaded.

A seedling plant of the peach tree and one of the ampelopsis and ivy were placed nearly in the centre of the house, and under similar circumstances; except that supports, formed of very slender bars of wood, about four inches high, were applied to the ampelopsis and ivy. The peach tree continued to grow nearly perpendicularly, with a slight inclination towards the front and south side of the house, whilst the stems of the ampelopsis and ivy, as soon as they exceeded the height of their supports, inclined many points from the perpendicular line, in the opposite direction.

It appears, therefore, that not only the tendrils and claws of these creeping dependent plants, but that their stems also, are made to recede from light, and to press against the opake bodies, which nature intended to support and protect them.

M. Decandole, I believe, first observed, that the succulent shoots of trees and herbaceous plants, which do not depend upon others for support, are bent towards the point from which they receive light by the contraction of the cellular substance of their bark upon that side, and I believe his opinion to be perfectly well founded. The operation of light upon the tendrils and stems of the ampelopsis and ivy appears to produce diametrically opposite effects, and to occasion an extension of the cellular bark wherever that is exposed to its influence; and this circumstance affords, I think, a satisfactory explanation why these plants appear to seek and approach contiguous opake objects, just as they would do if they were conscious of their own feebleness, and of power in the objects, to which they approach, to afford them support and protection.

The tendril of the vine, as I have already stated, is internally similar to that of the ampelopsis, though its external form, and mode of attaching itself, by twining round any slender body, are very different. Some young plants of this species, which had been raised in pots in the preceding year, and had been headed down to a single bud, were placed in a forcing-house, with the plants I have already mentioned; and the shoots from these were bound to slender bars of wood, and trained perpendicularly upwards. Their tendrils, like those of the ampelopsis, when first emitted, pointed upwards; but they gradually formed an increasing angle with the stems, and ultimately pointed perpendicularly downwards; no object having presented itself to which they could attach themselves.

Other plants of the vine, under similar circumstances, were trained horizontally; when their tendrils gradually descended beneath their stems, with which they ultimately stood very nearly at right angles.

A third set of plants were trained almost perpendicularly downwards; but with an inclination of a few degrees towards the north; and the tendrils of these permanently retained very nearly their first position relatively to their stems; whence it appears, that these organs, like the tendrils of the ampelopsis, and the claws of the

ivy, are to a great extent under the control of light.

A few other plants of the same species were trained in each of the preceding methods; but proper objects were placed, in different situations near them, with which their tendrils might come into contact; and I was by these means afforded an opportunity of observing, with accuracy, the difference between the motions of these and those of the ampelopsis, under similar circumstances. The latter almost immediately receded from light, by whatever means that was made to operate upon them: and they did not subsequently show any disposition to approach the points from which they once receded. The tendrils of the vine, on the contrary, varied their positions in every period of the day, and after returned again during the night to the situations they had occupied in the preceding morning; and they did not so immediately or so regularly bend towards the shade of contiguous objects. But as the tendrils of this plant, like those of the ampelopsis, spring alternately from each side of the stem, and as one point only in three is without a tendril, and as each tendril separates into two divisions, they do not often fail to come into contact with any object within their reach; and the effects of contact upon the tendril are almost immediately visible. It is made to bend towards the body it touches, and, if that body be slender, to attach itself firmly by twining round it, in obedience to causes which I shall endeavour to point out.

The tendril of the vine, in its internal organization, is apparently similar to the young succulent shoot, and leaf-stalk, of the same plant; and it is as abundantly provided with vessels, or passages, for the sap; and I have proved that it is alike capable of feeding a succulent shoot, or a leaf, when grafted upon it. It appears, therefore, I conceive, not improbable, that a considerable quantity of the moving fluid of the plant passes through its tendrils; and that there is a close connection between its vascular structure and its motions.

I have proved in the Philosophical Transactions of 1806, that centrifugal force, by operating upon the elongating plumules of germinating seeds, occasions an increased growth and extension upon the external sides of the young stems, and that gravitation produces correspondent effects; probably by occasioning the presence of a larger portion of the fluid organizable matter of the plant upon the one side than upon the other. The external pressure of any body upon one side of a tendril will probably drive this fluid from one side of the tendril, which will consequently contract, to the opposite side, which will expand; and the tendril will thence be compelled to bend round a slender bar of wood or metal, just as the stems of germinating seeds are made to bend upwards, and to raise the cotyledons out of the ground; and in support of this conclusion I shall observe, that the sides of the tendrils, where in contact with the substance they embraced, were compressed and flattened.

The actions of the tendrils of the pea were so perfectly similar to those of the vine, when they came into contact with any body, that I need not trouble you with the observations I made upon that plant. An increased extension of the cellular substance of the bark upon one side of the tendrils, and a correspondent contraction upon the opposite side, occasioned by the operation of light, or the partial pressure of a body in contact, appeared in every case, which has come under my observation, the obvious cause of the motions of tendrils; and therefore, in conformity with the conclusions I drew in my last memoir, respecting the growth of roots, I shall venture to infer, that they are the result of pure necessity only, uninfluenced by any degrees of sensation or intellectual powers.

Process for making artificial Stone for Chimney-pieces, as a substitute for Portland Stone; by Charles Wilson, 35 Worcester-street, Borough.

[From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.]

Twenty-five guineas were voted by the Society for this invention.

Take two bushels of sharp drift sand, and one bushel of sifted slacked quick-lime, mix them up together with as little water as possible, and beat them well up together for half an hour, every morning for three or four successive days, but never wet them again after their first mixture.

To two gallons of water, contained in a proper vessel, add one pint of single size, made warm; a quarter of a pound of allum, in powder, is then to be dissolved in warm water, and mixed with the above liquor.

Take about a shovel-full of the first